THE AMERICAN BREEDERS MAGAZINE

ORGAN OF THE AMERICAN BREEDERS ASSOCIATION

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Announcement

Since the last issue of this magazine, the American Breeders Association has undergone a complete reorganization, due to the retirement from public life of the Hon. James Wilson, its honorary president, and the resignation of the Hon. Willet M. Hays, secretary-treasurer, and of George W. Knorr, editorial secretary. To increase its efficiency, the association has incorporated under the laws of the District of Columbia. A report of the reorganization and a list of the new officers will be found elsewhere in this number.

These changes have resulted in new plans for the organ of the association, THE AMERICAN BREEDERS MAGAZINE. The desire of the new management is, briefly: to retain the high standard of scientific accuracy which has made the magazine valued in the past, but at the same time to present articles of such a nature, and so well illustrated, that they will interest not only those working in the particular field of which the article treats, but all who desire to keep informed in an authoritative way of progress made in plant and animal breeding and eugenics.

In the future the magazine will be issued monthly. The numbers appearing in October, November and December of this year will complete the current volume, number four. Beginning with volume five in January, the magazine will be increased in size. Members of the association understand that the magazine is published solely for their benefit, that it is not a money-making institution, but that all profit from it will be devoted to the improvement of the magazine or, eventually, to the promotion of research in certain lines that are neglected because they do not offer immediate commercial results.

At present, however, the magazine is not even self-sustaining. Its continued publication has been made possible only by the generous support of a number of members who have pledged a guarantee fund to meet possible deficits during the first few years. In order that all members may derive the greatest possible benefit from it, the magazine must be made financially profitable, through an increase in membership of the association. To put the finances on a sounder basis, it has been found necessary to discontinue the publication of the annual report, and material which formerly was printed in this will hereafter be included in the monthly magazine.

To bring about the fullest measure of co-operation between the nearly 2000 students of genetics who make up the American Breeders Association, it is therefore first of all necessary that the membership should be increased, and every member is asked to feel a personal responsibility in this matter, not only in the interests of the science of genetics, but in his own interests as a student of that science and a member of this association. In the second place, members of the association are urged to use its magazine as a channel for the publication of results of their work in plant and animal breeding and eugenics.

The original purpose and chief work of the association is to secure an interchange of ideas between workers on different aspects of heredity and environment. If it is to serve this purpose through its magazine, articles printed in the latter must be of a popular character; that is, an article on plant breeding, for example, must not be unintelligible to the student of eugenics, or vice versa. This does not mean that technical terms may not be used nor technical questions discussed. As long as the treatment of such matters can be kept in the plane of intelligibility to the general scientific reader, such papers will be especially welcome. Perhaps the best way of making a technical article intelligible and interesting to one who is not a specialist is by the use of photographs, and writers are particularly urged to pay attention to this feature; the magazine will co-operate with them to the extent of its financial ability, in properly illustrating their articles. But in order to make the developments of genetics accessible to as large a circle of readers as possible, it wishes strongly to urge its contributors to avoid too narrow a technical view of their subjects, and to emphasize as far as possible the broad principles underlying their work. To the limit of its ability to discriminate, the council of the association will avoid

the publication of any material which is not of a scientific nature, in the deepest sense of the word.

In its endeavor to make the American Breeders Association advance the interests of science, the council hopes for the co-operation of everyone interested in the most important branch of science—that which deals with the production of better plants, animals and men.

New Citrous Fruits

Successful Hybrids—The Citrange, Tangelo and Limquat—Cold-Resistant Substitutes for the Lemon and Lime—Future Possibilities*

WALTER T. SWINGLE,

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In the spring of 1910, I presented to the horticultural societies of Alabama and Florida, two papers on the breeding of new types of citrous fruits. As these papers were published in the proceedings of those horticultural societies[1] [2] it is not necessary for me to rehearse here the accounts published there in full. For the benefit of those who have not followed the work I may state that citrous breeding work was begun by me in Florida in 1893, but that the hybrids made at that time were for the most part lost during the great freeze of the winter of 1895-6; that the most important work was that carried on in the spring of 1897 when I made a determined effort to originate hardy citrous fruits by crossing the common oranges with the hardy Chinese *Citrus trifoliata*. In all 212 crosses were made, of which one parent was *Citrus trifoliata*. Three fruits were secured which yielded altogether 13 true hybrids. When these fruited they turned out to be a new type of citrous fruit, so different from any then existing as to require a new name and they were

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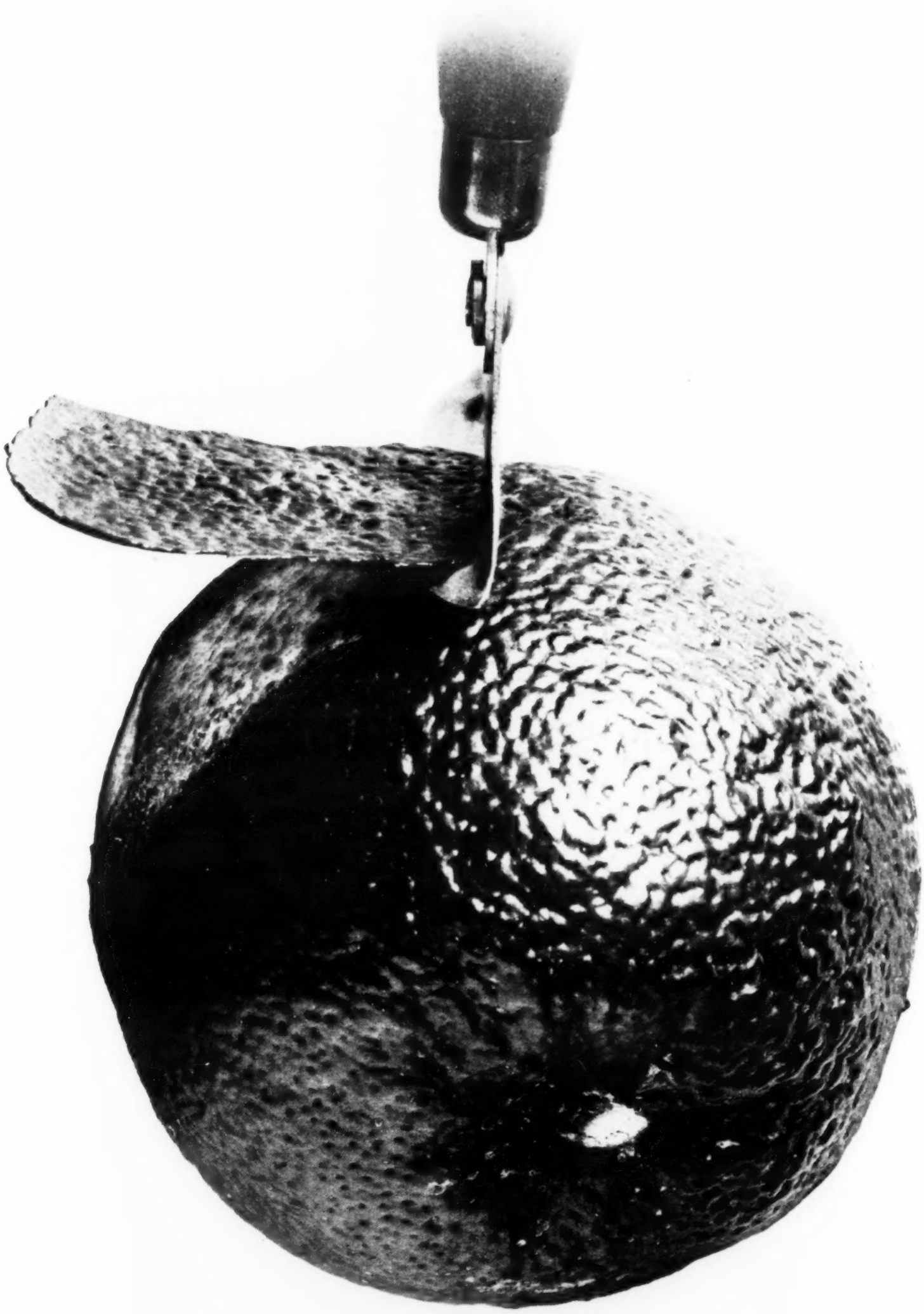
* Read before the American Breeders Association, Ninth Annual Meeting, Columbia, South Carolina, Jan. 25, 1913.

[1] Swingle, Walter T., 1910, New types of Citrus Fruits for Florida (read May 18, 1910), in Proceed. 23 Ann. Meet. Florida State Hort. Soc., Ormond, Fla., pp. 36-41, pls. 1-8.

[2] Swingle, Walter T., 1910, New Methods of Breeding and Testing Hardy Citrous Fruits (read Jan. 28, 1910), in Rept. 7 Ann. Meet. Alabama State Hort. Soc., Bessemer, Ala., in Bull. State Dept. Agric., Serial No. 36, pp. 190-200.



MORTON CITRANGE, NATURAL SIZE.

A remarkable hybrid between the Japanese orange, hardy as far north as Washington, and the ordinary orange. To avoid the strong oil in its glands, the skin should be peeled before cutting the fruit. (Plate 1.)

accordingly called "Citranges" by Dr. H. J. Webber and myself.* Citranges vary greatly in size, shape and color, but are all alike in having very abundant acid juice of an aromatic and slightly bitterish taste. A very good substitute for lemonade can be made from them and they can also be used for culinary purposes. Citranges are admirably adapted for home use throughout most portions of the Cotton Belt, where the climate is far too cold for growing ordinary citrous fruits.

The best citranges thus far produced are undoubtedly the Morton, Colman, Savage, Rusk and Cunningham. The first three named are large fruits, the largest being the Morton, which frequently exceeds a pound in weight (Pl. I). It is nearly round and closely resembles a large orange. It may be served as a breakfast fruit if plentifully sprinkled with sugar. The Colman, on the contrary, is somewhat flattened and can be distinguished at once by its mottled yellow skin which is covered with a fine fuzz. The peel of this citrange does not contain the disagreeable oil common to the others (Pl. II). The only other citrange having fuzzy skin is the Cunningham, which is a small fruit resembling a miniature Colman. The Savage has the external appearance of an orange except that it is slightly flattened and exhibits a tendency to ribbing. It is considerably smaller than the Morton. The Rusk is the smallest of the citranges, eight average size fruits going into a quart measure. The tree itself is an ornament, being loaded with white blooms in Spring and with brilliant red fruits in Fall (Pl. V). It is the most prolific of all and the most precocious, frequently bearing the third year after budding.

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* These citranges have been described in the following papers:

Swingle, Walter T., and Webber, Herbert J., 1898, Hybrids and Their Utilization in Plant Breeding, in Yearbook Dept. Agric. for 1897, p. 415, fig. 13.

Webber, Herbert J., 1900, Work of the United States Department of Agriculture on Plant Hybridization, in Journal Royal Hort. Soc., London, 24: 128-138, 144, figs. 42-47. Also reprinted separately, pp. 1-11, 17, figs. 1-6.

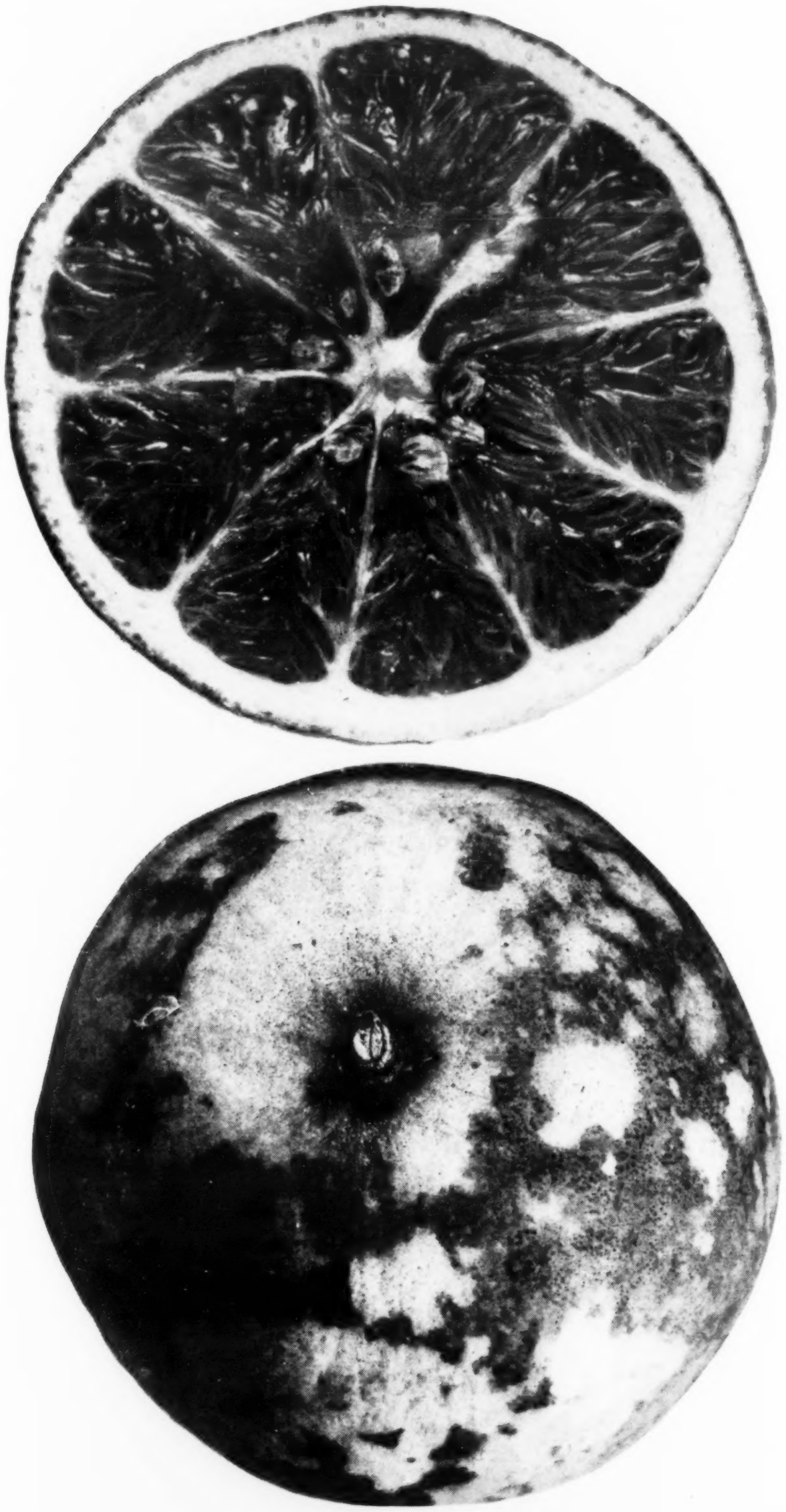
Webber, Herbert J., and Swingle, Walter T., 1905, New Citrus Creations of the Department of Agriculture, in Yearbook Dept. Agric. for 1904, pp. 221-235, figs. 12-13, pls. 10-16.

Webber, Herbert J., 1906, New Fruit Productions of the Department of Agriculture, in Yearbook Dept. Agric. for 1906, pp. 275-278, fig. 80, pls. 17-19.

Webber, Herbert J., 1907, New Citrus and Pineapple Productions of the Department of Agriculture, in Yearbook Dept. Agric. for 1906, pp. 329-336, fig. 10, pls. 17-20.

Webber, Herbert J., 1912. Citrus-Arten, in Fruhwirt, D. C., Die Züchtung der landwirtschaftlichen Kulturpflanzen, 5: 107-121, figs. 18-24.

Swingle, Walter T., 1910-1913. See the articles cited elsewhere in this paper.



COLMAN CITRANGE.

This variety, shown natural size, is conspicuous by the dark blotches which are always present, and due to fungus growth among the fuzzy hairs covering the skin. Oil glands small and few. (Plate 2.)

The fruits of the Willits citrange exhibit a tendency to freakishness in shape, becoming sometime a mass of finger-like segments (Pl. III, IV). When of normal shape the fruits of this variety yield an abundance of juice of excellent quality. The Saunders citrange, though small in size and having a very rough thick skin, is of interest because of its good keeping quality (Pl. V).

The surprising variations exhibited by these citranges led to a renewed study of the phenomena of inheritance they manifest and in the autumn of 1911 I read a paper at the Fourth International Conference on Genetics at Paris, calling attention to the impossibility of accounting for observed variations by the ordinary laws of heredity and suggesting a new principle, Zygotaxis,* presumably of wide application in the explanation of these facts. I need not discuss this phase of the matter here. Suffice it to say that the wide variations exhibited by sister citranges of identical parentage showed the desirability of producing these hybrids in large numbers in the hope of occasionally securing an exceptionally valuable combination of characters. Accordingly, beginning in 1909, I again undertook the breeding of hardy citrous fruits on a very large scale and as a result some thousands of hybrids, containing more or less blood of the *Citrus trifoliata*, are now growing in various parts of the South.

At the same time that the original citranges were made in the spring of 1897 another hybrid was made between the tangerine orange and the grapefruit. The resulting fruit was also of a new type and was named "Tangelo." The first of these tangelos, which received the varietal name of "Sampson," has since come to be cultivated commercially on a small scale in several parts of Florida. It has developed in the course of this work that the tangelos show amost as much variation as do citranges and are almost as much unlike the parent species. Tangelos show little of the grapefruit and almost nothing of the tangerine, but are in effect new types of oranges showing a greater variability as to size and color and having, as a rule, a more sprightly flavor, in this respect approaching somewhat to the grapefruit. There can be no doubt that these hybrids called tangelos constitute an important source of new and improved citrous fruits for commercial

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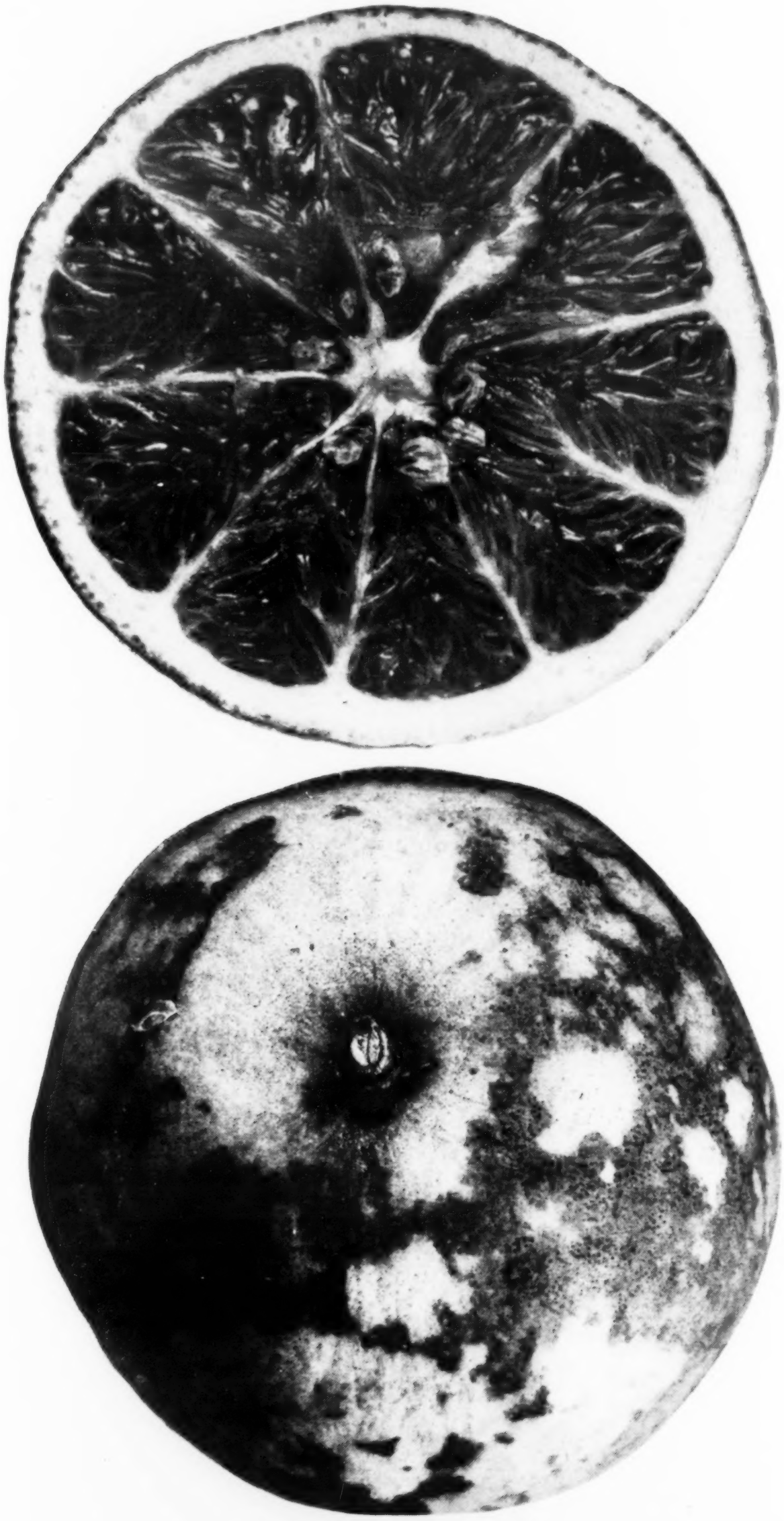
* Swingle, Walter T., 1913. Variation in First Generation Hybrids (Imperfect Dominance): its Possible Explanation through Zygotaxis, read Sep. 23, 1911, in Comptes Rendus de la 4ième Conférence Internationale de Génétique, Paris. p. 381-394.



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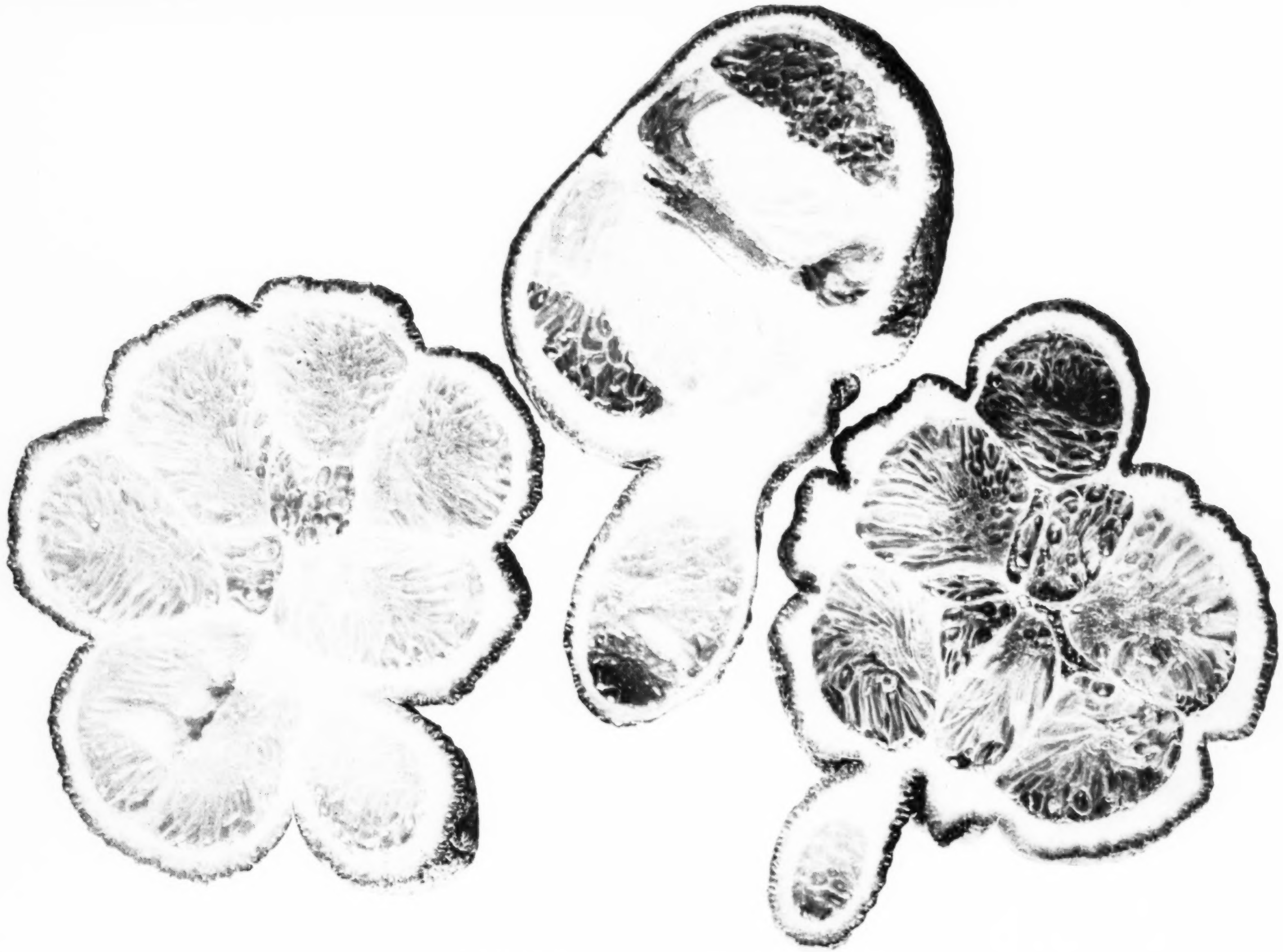


ABNORMAL WILLITS CITRANGES.

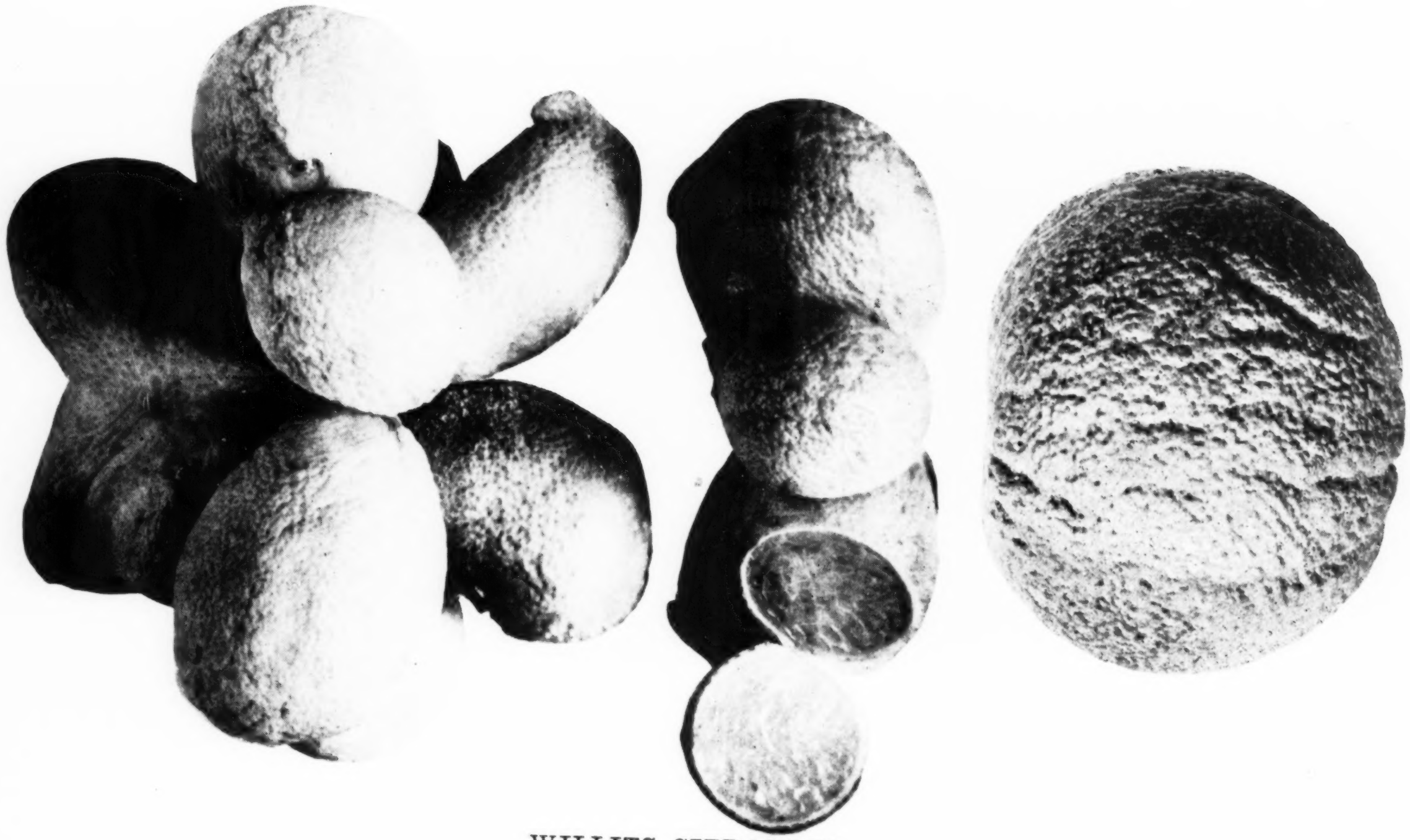
Cross sections, slightly less than natural size, of some of the abnormal types, which are of good flavor although of fantastic appearance. Produced particularly while the tree is young. (Plate 3.)

culture. Realizing this fact, I have for the past three years carried on extensive hybridization work in Florida with the help of F. W. Savage, and some thousands of new types of tangelos are now being propagated.

Another new type of citrous fruit is the limequat, which I originated in 1909 by crossing the common West Indian lime with the kumquat orange. I do not need to explain to those familiar with citrous fruits that the lime is the tenderest of all the commonly grown plants of this group. It is frequently frozen to the ground even in southern Florida and is often injured by frosts which have scarcely any effect on other citrous trees. The kumquat, on the other hand, is one of the hardiest of the evergreen citrous fruit trees. This is without doubt due not so much to its direct powers of cold resistance as to its remarkable dormancy. The kumquat is able to pass unaffected through long spells of hot weather which force other citrous trees into a tender and succulent growth that is liable to be injured by even a slight frost. Some measure of its dormancy is indicated by the fact that it flowers from two to three months later than other citrous trees. Fortunately the pulp of the kumquat, although small in amount, is mildly acid and, as might be expected, the hybrids between the lime and the kumquat prove to be of a very desirable character. The limequats vary in size from that of a large kumquat to that of a small lime. The skin is thin and of agreeable aroma and flavor, the pulp juicy and of varying degrees of acidity, some of the hybrids being almost as acid as the sourest lime, others being scarcely more acid than the kumquat itself. Here again we have great variation in first generation hybrids, due probably to zygotaxis, as in the cases of citranges and tangelos.

With this brief summary of the accomplished results I beg leave to direct your attention to what I consider some of the more important lessons of this work, one of the first of the lines of plant breeding work to be established in this country and one which is now being carried out perhaps on the largest scale and with the most complete record of any fruit breeding work. Nevertheless I consider that the work done hitherto is merely of a preliminary order and of comparatively little importance.

As long ago as April, 1893, I read at the Pensacola meeting of the Florida Horticultural Society an account of some citrous fruits which were being introduced into Florida, and emphasized the value of these wild relatives of our cultivated citrous fruits for



WILLITS CITRANGES.

At the right is the normal type, of excellent quality, while at the left is shown the fingered type, natural size. This abnormal type is uncommon in first generation hybrids, a fact that is not in accord with the ordinary ideas of Mendelism. (Plate 4.)

use in hybridizing.* It was not until some three years ago that I was finally in a position to take up this work planned twenty years ago, but these recent investigations have brought to light a large number of wild relatives of our citrous fruits, undoubtedly closely related to the commonly cultivated species. Many of these plants have been entirely neglected by horticulturists and their relationships misunderstood by botanists. A few examples will prove the truth of this statement. In the deserts of Australia there is found a small acid fruit edible in its wild state, and called by the settlers "desert lime" or "desert lemon" (*Atalantia glauca* (Lindl) Benth). It was first found growing in a region where such thick ice had formed that it had to be broken with an ax before the horses of the exploring expedition could get water to drink. Undoubtedly this desert kumquat has occasionally been subjected to temperatures almost as low as zero Fahrenheit. Here, then, is the hardiest of all the evergreen citrous trees producing in the wild state edible fruit which has, nevertheless, so far as I know, entirely failed to attract the attention of plant breeders in any part of the world. Certainly our correspondence seems to show that the desert lemon is not grown even in the botanic gardens of Australia, to say nothing of those of other countries. After considerable difficulty I succeeded, through the co-operation of the Office of Foreign Seed and Plant Introduction, in securing a quantity of seed of this species, and young plants are now growing in our greenhouses and in the southern and southwestern states. How much more promising is this species for use in breeding hardy citrous hybrids than is, for instance, the trifoliate orange, with its seedy fruit, acrid skin and scanty juice!

Throughout Central Africa there occur a number of species of *Limonia* (*L. Preussii* Engl., and related species) which upon study are found to be very closely related to *Citrus*. They bear large numbers of small, highly-colored, aromatic, delicious-flavored oranges clustered like cherries at the nodes of the branches. After some delay I succeeded in securing from Africa seeds of one of the species of this new group of citrous fruits, which we have been calling "cherry oranges." They grow rapidly and can be grafted readily on all the common citrous stocks. Unlike the species of

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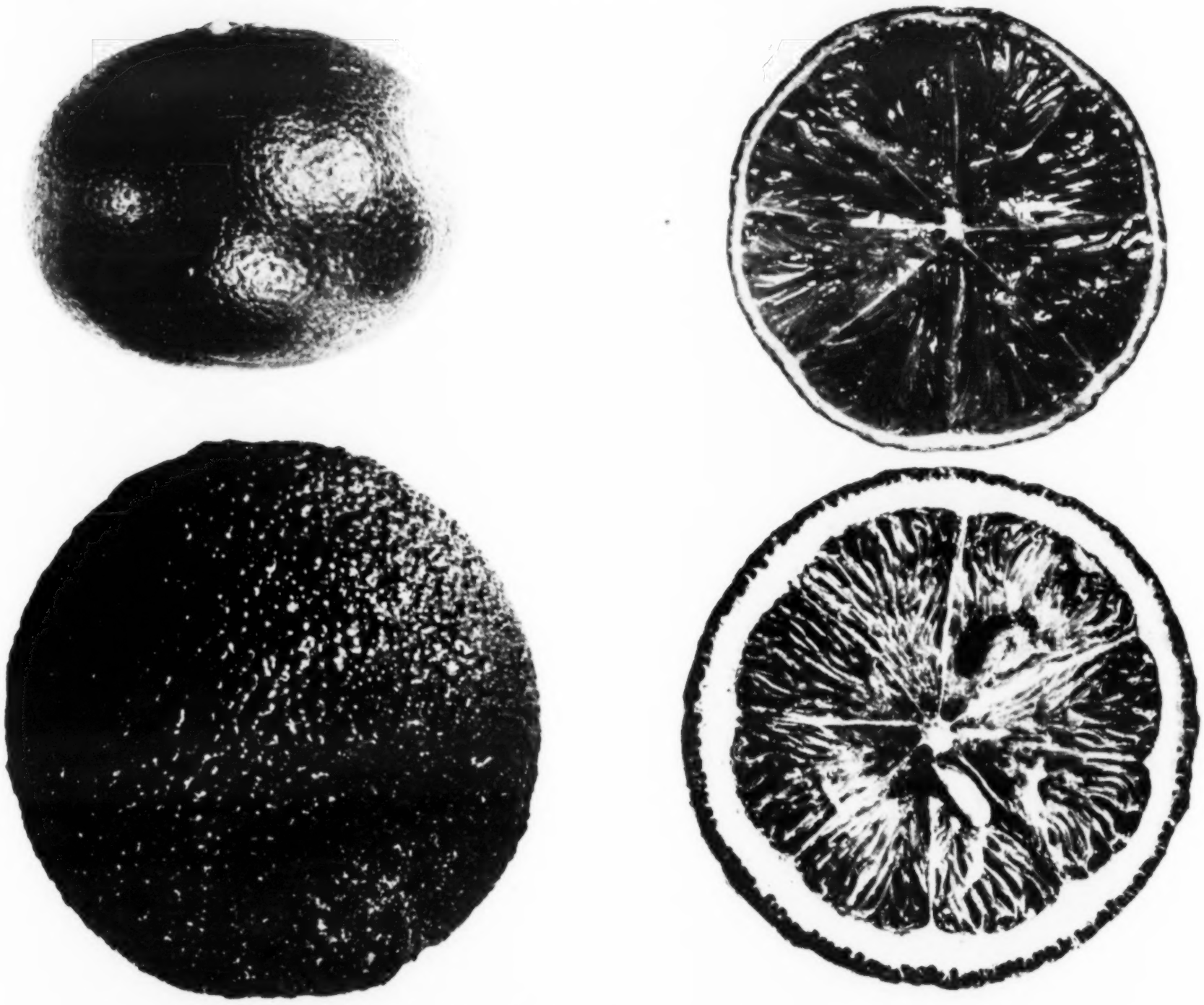
* Swingle, W. T., 1893. Some Citrus Fruits That Should be Introduced Into Florida, in Proceedings of the 6th Annual Meeting of the Florida State Horticultural Society, Pensacola, Fla. Pages 111-121. (Read April 13, 1893.) Tallahassee, Fla.



RUSK AND SAUNDERS CITRANGES.

Rusk (above) has a smooth, thin skin of bright orange-red color, while the Saunders (below) has a thick skin and very large, prominent oil glands, making it a good keeper. Both natural size. (Plate 5.)

Citrus, these African cherry oranges have compound leaves composed of from three to seven very large leaflets. It is not uncommon for a single compound leaf of an African cherry orange to have a surface ten times as large as that of a common orange leaf. When we reflect that the sugar that sweetens the fruit and the aromatic substances that give it flavor and perfume are formed in the leaves we realize how important it is to secure large-leaved forms of our cultivated plants.

Through a new system of grafting it has been possible to force some of these African cherry oranges to flower when they were less than two years old. In this way it has been possible to make a few

hybrids with species of Citrus. It can be imagined with what interest we await the result of these first experiments.

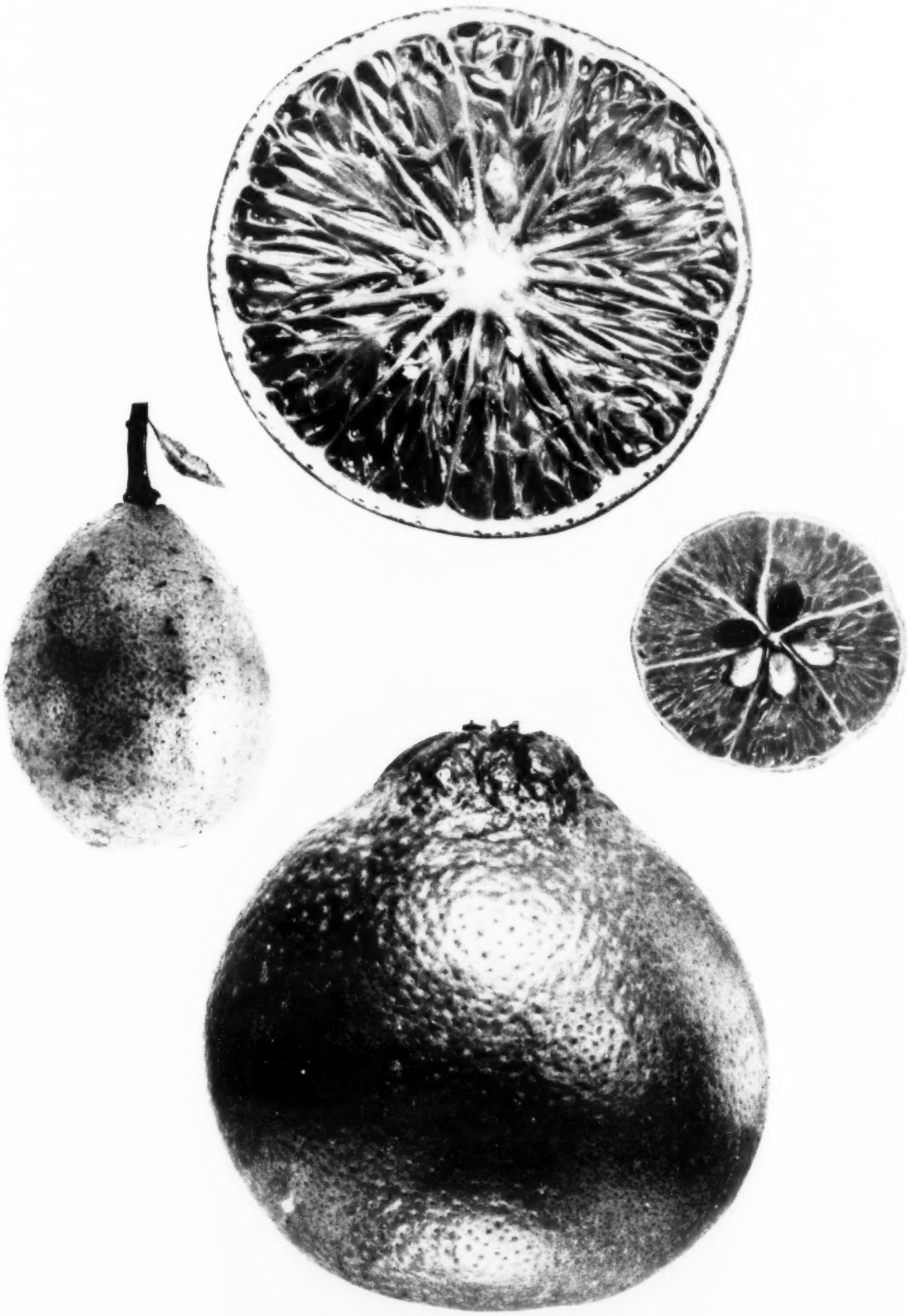
Other examples almost equally striking could be given to show what valuable material awaits the attention of the plant breeder. I think I am justified in stating that almost all of the plant breeding work done in this country, or any other country for that matter, has been very seriously handicapped by a lack of accurate knowledge as to the material available for use in hybridizing. I consider it the duty of plant breeders to inform themselves concerning the wild relatives of the groups they are breeding. To do this properly a thorough study of the group is necessary in order to discover the relationships of the different species and to suggest the most promising lines of hybridizing work. When we think of the hundreds of millions of dollars invested in the culture of our fruit and other crop plants and consider how frequently the varieties now cultivated suffer injury or death through lack of proper adaptation to the climate or soil, we realize how great is our responsibility to the people of this country and how imperative it is that we as plant breeders should inform ourselves as to the material at our disposal before spending public or private money in experiments carried on in an inadequate way. I am glad to say that we are now securing for our breeding work on the citrous group the wild relatives of the orange which I was so anxious to get twenty years ago. I think I can assure you that when this breeding work shall have progressed another ten years we shall have been able to demonstrate beyond any possible doubt the fundamental importance of securing a proper equipment of wild species with which to carry on the work.

I have looked into other groups in a preliminary way and am convinced that what I have said of citrous breeding applies with almost equal force to the improvement of nearly all other perennial fruits, berries and vegetables to which breeders are now giving their attention.

The new botany which gives us accurate information as to the number, morphological and physiological characteristics and relationships of the wild relatives of our cultivated plants will soon be recognized as absolutely essential to any defensible project for the improvement of our staple crop plants.

SAMPSON TANGELO.

Young fruiting tree growing at the Plant Introduction Garden, Chico, Calif. This hybrid is now cultivated commercially, and trees often fruit abundantly while still very young. (Plate 6.)



TANGELO AND LIMEQUAT.

Above and below is a Sampson Tangelo, while in the center is a limequat, obtained by crossing the common lime and kumquat. This is much more cold resistant than the ordinary lime. Fruits natural size. (Plate 7.)

Eugenic Immigration

The American Race of the Future and the Responsibility of the Southern States for its Formation. The "Survival of the Fittest"*

ROBERT DE C. WARD

Professor of Climatology, Harvard University, Cambridge, Mass.

Eugenic immigration, with its tremendous influence on the American race, shows its possibilities most clearly in the contrast between congested slums of northern cities and the need of labor in the South and West. On the one hand we have the tenement-house districts in all our large northern cities, with a population very largely of foreign birth or parentage; and a growing conviction of the impossibility, even with unlimited resources in men and money, of properly caring for, and of permanently raising the standards of living of, this population as long as it is thus crowded, and as long as the stream of newer immigrants pours in with as little attention to its proper selection as we pay at present. On the other hand we have vast areas in our western and southern States where the farmers, the cotton growers and the mine owners are calling for "labor."

Is it any wonder that the weary social workers of these northern cities are saying that if this congested population could be distributed over the southern and the western states many of the difficulties which are now met with in caring for, in educating, and in assimilating these aliens would disappear? Is it surprising that the farmers, the cotton growers, the mine owners, should on the whole look forward to this new movement of population into their own districts as likely to solve for them the great problem of "lack of labor"? And does it strike any one as strange that our railroads and the foreign steamship companies should favor such a scheme of distribution, which clearly means more business for them?

The people of the South at present hold the key to the immigration problem, eugenically considered. If they say: "We want *anybody* we can get to work for us; if we cannot have a strong, intelligent, skilled laborer we will take one who is of low vitality, poor physique, mentally deficient, and unused to outdoor work," then the

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*Address read at the ninth annual meeting of the American Breeders Association, Columbia, South Carolina, January 24, 1913.

charity workers in our northern cities, and our railroad companies, will send all sorts of aliens who are generally regarded as a burden in the North into these southern states.

If, on the other hand, the people of the South clearly recognize the fact that our present immigration laws make it possible for thousands of aliens to land here every year who are likely to be not a benefit but an injury; who are weak and sickly; who may have come because they were inveigled into buying a passage ticket by a steamship agent, then they will insist on having none but honest, industrious, healthy and fit immigrants. Such aliens there are in abundance in our large northern cities, who would be far better off in the country. These are the ones whom the South wants. Shiftless, sickly and unfit immigrants there are also in abundance in our large northern cities. These, I take it, the South does not want. Neither do we of the northern cities want them. Yet they continue to pour in on us because we have not yet properly regulated the flood. To send out from the large cities of the North thousands of unfit aliens who are not desired in the country districts of the West and South, simply because our charitable agencies in the North think they can thus relieve themselves of an unpleasant burden, is much like throwing one's weeds over one's neighbor's fence, into his garden.

There are certain evils which will follow in the train of a wholesale and indiscriminate distribution of our immigrants which the South may well consider. To scatter among our rural communities large numbers of unselected aliens whose standards of living are such that they are willing to work for the lowest possible wage, is to expose our native population to a competition which is distinctly undesirable. Again, the more widely we scatter the newer immigrants, the more widespread will be the effect of the competition with the lower grades of alien labor in causing a decrease in birth rate among the older portion of our population. American fathers and mothers, as the late Gen. Francis A. Walker first pointed out, and as I believe all our leading economists now agree in thinking, naturally shrink from exposing their sons and daughters to competition with those who are contented with lower wages and lower standards of living; *and, therefore, these sons and daughters are never born.* This may, or may not, be for the eugenic welfare of the race, but it certainly does tend, if this condition exists, to bring about a relatively rapid race-replacement. The distribution of *unselected* immigrants throughout the South will, I believe, mean the

gradual replacement of the native by mentally and physically inferior foreign stock, which is already going on in the North.

There is not time on this occasion to take up the evidence, which exists in abundance, of the unsatisfactory and unfit character of much of our present immigration. It is clear that the race migration now going on from Europe and Asia to the United States is to a considerable extent not a "natural" movement, but an "artificial selection," as it were, of some eugenically undesirable elements of the old-world populations. It is evident that a dangerously large fraction of our present immigration is as unfit on the farm as in the city; that it is of low vitality and poor physique; and often diseased and mentally deficient. There is no higher authority on immigration in this country than William Williams, the able and efficient Commissioner of Immigration at the Port of New York: he tells us that our immigration laws "do not reach a large body of immigrants who * * * are * * * generally undesirable, because unintelligent, of low vitality, of poor physique, able to perform only the cheapest kind of manual labor, desirous of locating almost exclusively in the cities, by their competition tending to reduce the standard of living of the American wage-worker, and unfitted mentally or morally for good citizenship. * * * If these persons could have been induced to stay at home, nobody, not even those clamoring for more labor, would have missed them. Their coming has been of benefit chiefly, if not only, to the transportation companies which brought them here." Mr. Williams further says that thousands of incoming aliens are neither physically nor mentally fitted to go to the undeveloped parts of our country and "do as did the early settlers from northern Europe."

The people of the South are in a position to exercise a determining influence upon the character of the future American race, because, whenever any demand is made upon Congress for further immigration legislation, even of so mild yet so necessary a character, for example, as the better exclusion of those who are physically below par and are likely to be undesirable, both economically and as parents of future American children, the argument which is always urged against such a step is that "The South needs labor to develop its resources." The people of the South must realize that a wholesale distribution of unselected aliens will not give them the labor they need; will injure the quality of the American race of the future; will spread more widely the evils which result from

exposing our own people to competition with the lower classes of alien labor. Hence, the South must become a strong supporter of any reasonable measure of a further eugenic selection of immigration, for it cannot fail to see that the continued influx of hundreds of thousands of unhealthy and unfit immigrants is a burden upon and a detriment to the whole country.

Obviously, intelligently directed distribution of desirable immigrants is most essential, but the immigrants must be sent where they will find work which they are physically and mentally fitted to perform. This country needs and wants none but honest, industrious, intelligent, healthy and fit immigrants. Any reasonable legislation which shall improve the physical and mental quality of our immigration should be heartily supported in the South.

The contact between economic and eugenic aspects of immigration is sometimes overlooked. We constantly speak of the need of more "hands" to do our labor. We forget that we are importing, not "hands" alone, but bodies, also. The vast majority of incoming alien immigrants are potential fathers and mothers, and the character of the race that is to be born here depends upon the kind of alien bodies which we are allowing to land on our shores day by day. It is just at this point that immigration becomes a eugenic problem. We, in the United States, ought to have a very special interest in it as such, for we are here forming a new race, of an extraordinarily heterogeneous character, and we have a remarkably favorable opportunity for practicing eugenic principles in the selection of the fathers and mothers of future American children, through our power to select our immigrants. Most of the discussions of this immigration problem in the past have been concerned with its economic side, but the eugenic and racial side far outweighs this. The days of a dominant Anglo-Saxon immigration are over, forever. From a trickling rivulet, forty years ago, when it furnished less than one per cent of our alien arrivals, Southern and Eastern European immigration has increased until it now numbers about 70 per cent of the total. It has become a flood, and the flood is increasing. Asia is contributing more each year. British India has begun to send the advance-guard of its coming millions. There are those who believe that the Anglo-Saxon American will disappear, like the Indian and the buffalo. And there are reasons for thinking that the burden of proof is on those who hold that he will *not* disappear.

Most of us have met these questions of a falling birthrate, and of the production of a new race in this country, with the doctrine of the "survival of the fittest." Some of us have said, "We may be sorry that the Anglo-Saxon race is losing ground; we may not enjoy the prospect of its replacement by a new race, with large strains of Latin, or of Slav, and perhaps also, in time, of Asiatic blood, but, after all, it is a question of the 'survival of the fittest,' and if we are not the fittest, we must, of course, go under." A similar philosophy is urged by those who, opposing all further regulation and selection of alien immigration, even along eugenic lines, rely—or say they do—largely upon the doctrine that free competition will, by a process of natural selection, result in the "survival of the fittest." This whole belief is based on an erroneous conception of the meaning of the phrase, the "survival of the fittest." This expression has been misunderstood and misused so often that the wrong use of it is far more frequent than the right use. What Spencer and what Darwin really meant was the survival, not of the "best," but of those most fitted to survive. These are not necessarily most fitted for any purpose except mere survival. A plant or an animal survives in proportion as it fits its environment. "The kind of microbe," says a recent writer, "that best fits into the environment provided by, say, human blood, is the fittest and will survive and be the cause of the commonest disease. Thus the tubercle bacillus is at once the fittest microbe, and not the best but the worst. In a society of blackguards, the biggest blackguard is the fittest man and will survive. He is also the worst man." "The capacity to fit into the environment is the capacity that determines survival; it has no moral connotation whatever." The eugenic ideal, the ideal of race culture, is to ensure that the fittest shall be the best.

What kind of a race will this be, made up of such diverse elements that, as Professor William Z. Ripley, of Harvard University, says, "the most complex populations of Europe are ethnically pure by contrast"? Truly, this is a "melting pot" for all the nations and peoples of the world. Into it we have allowed Europe, and now even Asia and Africa, to throw every sort of material, while we ourselves have been blissfully—or shall we not rather say criminally?—careless as to what the final product is to be. Will the new American race be a superior or an inferior one? Who shall say? Evidence is available on both sides of the question. Opposite views

upon it are held by those who have studied it. In the midst of a disagreement among the scholars, what shall the layman do? One thing is clear, and that is that the results of biological studies go to show that the crossing of different types must not be carried too far, or be too extreme, or proceed too rapidly. In the light of the evidence it is my opinion that the burden of proof is upon those who hold that the new American race will be superior, rather than inferior.

There can be absolutely no doubt that the recent change in the races of our immigrants will profoundly affect the character of the future American race. What the resulting physical and mental changes will probably be, various authorities have told us. The ethnic composition of an "average immigrant" (whatever that may be!) has radically changed during the past few years, the Baltic and the Alpine stocks giving way to the Mediterranean. The dilution of the energetic Baltic blood, which "combined with the conditions peculiar to a new country," has made us "preeminently an energetic, practical people, above all an industrial and political people," will, according to Professor Franklin H. Giddings, of Columbia University, inevitably cause a decline of this American push. The increasing proportion of Alpine and of Mediterranean blood will "soften the emotional nature, but it will quicken the poetic and artistic nature. We shall be a more versatile people, gentler in our thoughts and feelings because of the Alpine strain; livelier and brighter, with a higher power to enjoy the beautiful things of life" because of the Latin blood. "We may doubtless learn courtesy from many an Italian; virtue from many a Slav; family loyalty from many a Jew; the beauty and the refining influence of music from many a Hungarian." Physically, our average stature will be reduced, and our skulls will become broader and shorter.

He would, indeed, be a hopeless pessimist who should maintain that this racial change will have only undesirable effects, physical and mental, upon the future American race. We probably need less nervous energy and push. We shall undoubtedly benefit by a quickening of our artistic and our poetic nature. We shall probably not be injured by the infusion of some of the "conservative and contemplative stock which comes from southern Europe." The good qualities of this new immigration we may need. The defects we would willingly do without: we have already enough of our

own! But surely, it is rather reckless to assume that everything will settle itself for the best. It may be that the American race of the future is to be a far better, a far finer, a far nobler race than the world has ever seen; better and finer and nobler, possibly, than the American race which we ourselves have known. But let us remember that, as a recent writer has well expressed it, "in forming a race of unknown value, there is being sacrificed a race of acknowledged superiority in originality and enterprise."

Admitting, for the sake of argument, that a mixture of race stocks in this country is desirable, is it not at once apparent that the individuals who are to be the progenitors of this mixed stock should, at the least, be as good, mentally and physically, as the average of those already here, if there is not to be a gradual deterioration of our people? In other words, is not a careful selection of our immigrants, on eugenic lines, of the utmost importance? Here again, we see how the racial aspect of our immigration problem inevitably comes into contact with the eugenic aspect of it.

Conservation of our natural resources: how much we hear about that! Conservation of American forests is important. So is conservation of American coal, and oil, and natural gas, and water supply, and fisheries. But the conservation and improvement of the American race is vastly more important than all other conservation. The real wealth of a nation is the quality of its people. Of what value are endless acres of forests, millions of tons of coal, and billions of gallons of water if the race is not virile, and sane, and sound?

The need is imperative for applying eugenic principles in much of our legislation. But the greatest, the most logical, the most effective step that we can take is to begin with a proper eugenic selection of the incoming alien millions. If we, in our generation, take these steps, we shall earn the gratitude of millions of those who will come after us, for we shall have begun the real conservation of the American race.

New Plants for Breeders

Agriculture of the Future Will Show Marked Changes, as Result of Work of Office of Foreign Seed and Plant Introduction

DAVID FAIRCHILD

*Agricultural Explorer in Charge, Office of Foreign Seed and Plant Introduction, Bureau of Plant Industry, U. S. Department of Agriculture.**

We have learned to expect great changes in our agriculture because we have seen great changes already, but we each see them from a different angle. To me has fallen the lot of viewing agriculture from the standpoint of the plants whose culture composes plant industries. Today no one can afford to take anything less than a world view of agriculture.

It is from this standpoint that agriculture is considered by the Office of Foreign Seed and Plant Introduction, which was established by Secretary James Wilson in 1897, who always took a keen interest in the work of bringing in new plant industries from abroad. The movement was fortunate in being championed from its very beginning by Mr. Barbour Lathrop, of Chicago, who conducted three expeditions at his own expense, taking the writer with him and securing new plants, shrubs and trees throughout the little-known parts of the earth, and turning them over to the United States Department of Agriculture. This office already has been largely responsible for taking the initial steps which have led to such changes in the nation's crops as the introduction of durum wheat, the dissemination of the Siberian cold and drouth resistant alfalfas and the establishment of the date palm in the Southwestern States. The working out of these long-time problems, as is well understood by you, is being carried on by special officers of the Bureau, but I am confident that the near future will see American farmers entering into the production of many more crops which are now monopolies of foreigners, and at the same time improving their present crops in order to hold the markets which they now have. When oceans are highways of cheap transportation; when cold storage has put the Cape of Good Hope and New Zealand into competition with us; when cable letters and thousand-mile wireless

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* Extracts from an address delivered before the scientific staff of the Bureau of Plant Industry.

messages make instant communication possible, and twenty-knot boats make yearly visits to any part of the globe an easy possibility, we should no longer allow the farmers to feel safe for an indefinite period as producers of foodstuffs from the competition of the whole world.

We must be on the lookout for great changes and not let a natural conservatism stand in the way of our seeing the coming of such changes. If there were such a thing as an agricultural globe, you would be surprised many times when you came to study it. You would find so little of it inhabited, so many places crowded with incredible millions of people, such vast tropical regions covered with perpetual forests, so little cold country, and so much frostless country. But perhaps what would strike you most would be the fact that you did not know the crops. You would find cultivated plants forming the main food of millions of people and even the names of them would be strange to your ears.

You would travel for miles perhaps through the yerbales of the Argentine and Paraguay or photograph the great orchards of Khat in western Arabia and be surprised that three million or more people take their thein in the form of maté instead of tea and that Khat leaves are so prized by the inhabitants of Yaman as a stimulant for chewing that the poor coolies will pay half their wages for Khat. You would find fields of the chickpea everywhere in Spain, and the shops would be selling them by the bushel. You would see orchards of the dry-land carob in eastern Spain and find the hill-sides of Crete and Candy and southern Italy covered with the same beautiful shade tree, the pods of which are one of the best fodders known. You would find the Chinese growing strange water plants in their canals and ponds and making candied delicacies from their roots or using them in their soups and stews. You would see the Japanese sea-shore farmers cultivating sea weeds on stakes set knee deep in the water of their coast or piling up logs on which to grow their edible mushrooms or tending carefully hundreds of acres of giant grasses or bamboos for the tender succulent shoots which they produce and the incomparable woody material which they get from their stems. You would look down on square miles of palm trees in the oases of Arab countries and see the Arabs gather more dates from a single palm tree than you ever saw in your whole life before, and you would see that there were as great differences between date varieties as there are between apples.

You might see some of the other great palms of the world,—the oil palm of Africa, whose culture is rapidly growing into a great industry, or the ivory palm of Columbia, which furnishes our buttons, or the sugar palm of Java, which makes as fine-flavored a sugar as our maple, or that other one in Chile which formed forest now rapidly disappearing to furnish sap for the syrup makers.

You would notice lines of cattle and camels tethered in great fields of berseem clover, fattening on it, and you would learn that alfalfa is being introduced into Egypt, but has not yet proved as good as berseem on the Nile silt. You would see the peasants of Malta bundling up six-foot-tall sulla clover which their forefathers for centuries have grown on the limestone soils of that tiny island, and whose culture probably came from the neighboring coast of Tunis. You would find pistache nuts and pistache candy was being hawked about the streets of Athens as roasted peanuts and peanut candy are in Washington.

And let us not think, because these are old cultures—often many centuries old—that they are doomed whenever they come into competition with the crops which we happen in this country to have taken up first as settlers in America.

Let me ask if anyone can tell why the cassava will never compete with corn for food production or why the avocado should not rival the orange as a table food or the Oriental persimmon be eaten fresh or dried by millions throughout the South, or the prickly pear fruit, which will keep a year without spoiling, become an important article of commerce? These all sustain life, and why should not they be utilized and compete for their proper places in our agriculture? They will compete and are competing just as so many other things have competed and won out.

I realize it is very difficult for one to believe that something which he personally dislikes can ever make a market for itself, but taste is largely a matter of habit. Steffanson related the other evening in my hearing how some of his sledge dogs which had always fed on seal meat refused and one of them nearly starved to death on caribou meat, while dogs accustomed to caribou meat absolutely had to be starved before they would touch seal meat. We shall not be able to starve people into eating things, but fashions in food will change and bring up the new things so often to them that they will learn to eat them. It is a slow process, but it is working all the time all over the world, as is evidenced by the

new beef and mutton stalls in Japan and the Chinese restaurants in America, and the immense soy bean exports from Manchuria to Germany. Things which you have always thought of as of small importance because you knew so little of them, you find to be the great money crops covering square miles of territory and absorbing the lives of hundreds of thousands of people. These considerations have made some of us feel that the American farmer is familiar with very few crop plants and has led us to wonder whether it were not a short-sighted policy to keep him in ignorance of the world products and their production which at any time may become competitors.

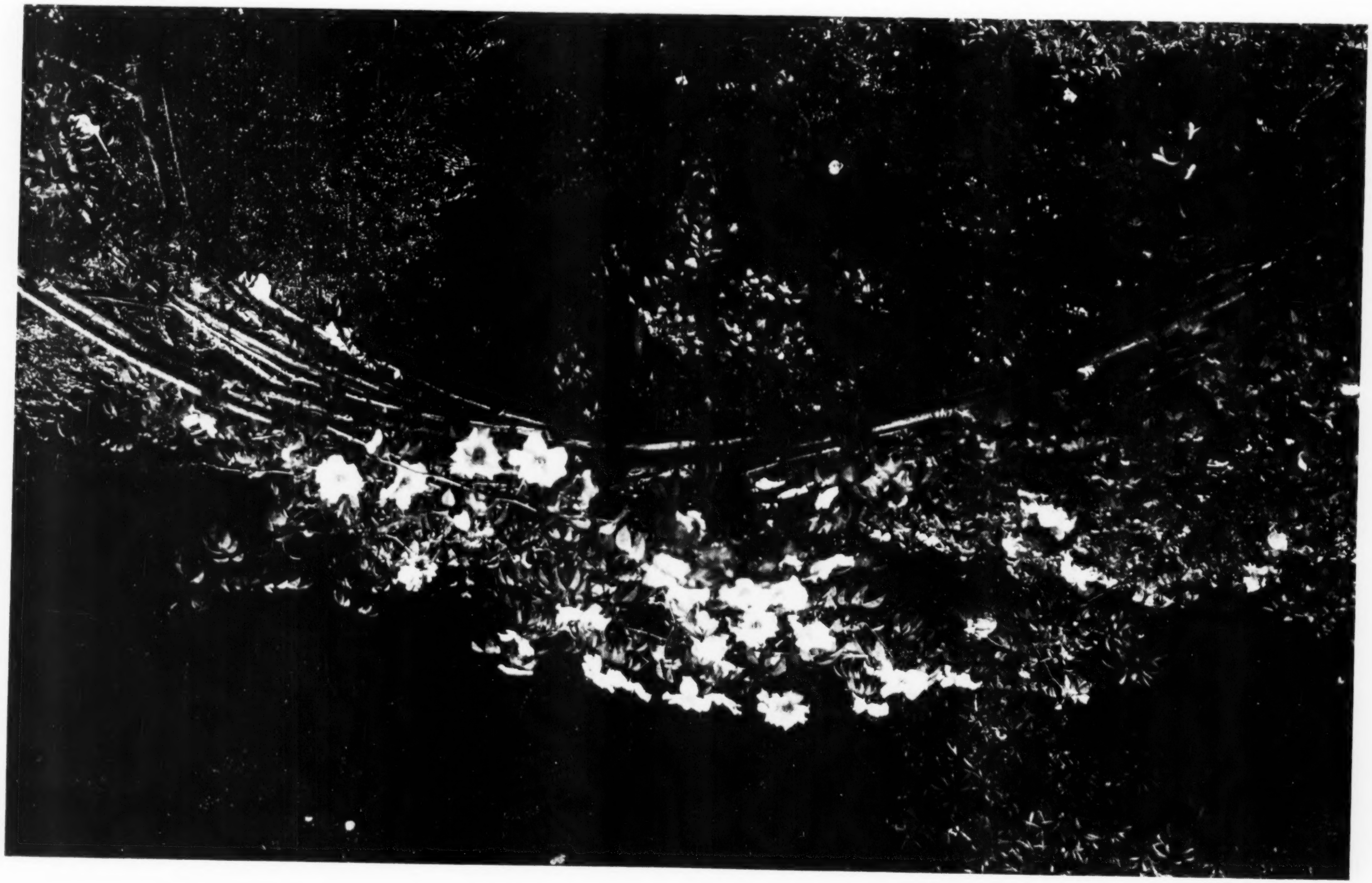
One of the first great objects of the work of plant introduction is to get the farmers of the country to realize that there are many more kinds of farming than they dreamed possible, and that new kinds are coming into existence all the time in various parts of the world, and that there is no reason why the kinds should not be rapidly increased. To develop a race of thinking, independent farmers, we must give them a chance to see the crop plants which could be grown in their localities and give them time to think about them. There is something wonderful in the practical sense of an American farmer and in his ability to turn things about him to account. How can this be done unless a systematic search of the world is made, and hundreds of thousands of plants imported and scattered where thinking men and women can see them and devise means of utilizing them? There are many thousands of people who enjoy the pleasure which comes from growing something which they have never seen before and finding the best use for it. This plan of going out into the highways, not only in search of the crop plants but the experimenters who will test them, is an American plan and differs essentially from the arboretum plan of the old world whereby the plants were brought in and kept in a menagerie, as it were, under lock and key, so carefully that few farmers ever saw them, much less had a chance to grow them. Dr. Gustav Eisen, a Californian, has just written from Rome that there is in the Pincian garden there an avocado tree one hundred years old, and yet one of Italy's best horticulturists was here not long ago and was eager to know about the avocado tree which he had seen in California. This illustrates the difference in the method. Our plans have been to propagate avocados by the thousand and send them everywhere in hopes of getting into the hands of every one who is a good experimenter

one or more of these trees, which in a few years would stir the man's imagination by its remarkable fruit.

Let those who can, co-operate in this work by putting into their gardens some new plants for the pleasure merely of playing with them and watching them grow, and the country will reap the benefit either directly, in the establishment of them as new industries, or in the bearing which they have on the work done on other crops. Some of my critics have raised the point in regard to this work that men get discouraged in trying to grow new things, and that, therefore, new plants should not be sent them until they were thoroughly tested and proven to be successful. In other words, the government, at excessive expense, should make a perfect money-making thing, and then make a market for it, and then give it away to people who could make money out of it. This is not my conception at all of the way our agriculturists are to be made into the most resourceful, independent, progressive elements of our civilization. The successful farmers are men who learn how to find out things for themselves, and any method which stimulates the thirst to know and find out is far better than one which teaches methods, no matter how good the methods may be.

Plant introduction then, as it is being developed in the bureau, is an instrument for arousing interest and developing the spirit of inquiry among the farmers.

Carried on as a government policy over a long series of years, what will be the result of this plant introduction work? That is the question which statesmen have to decide. To my mind there can be no question that it will be one of the great agents in the diversification of our agriculture and help to lessen the losses which occur by the shifting of farm industries from one region to another. It is in line with the development of the human race, which is moving from the one food basis of the savage toward a multiple food standard. It will lead to substitution in our foods of better for inferior things. It will result in the creation of those natural plant monopolies upon which the agricultural wealth of a country should rest, monopolies such as have made the peasantry of France so well to do. It will lead to the utilization of land by that crop which is best able to create food or other valuable material on that land. It will lead to the substitution of tree crops for annual crops wherever they are of advantage. It will assist in the utilization of waste lands all over the country. It will help make the roadsides,



THE LARGEST WILD ROSE KNOWN

(*See photograph on opposite page*)

The Giant Rose of the Himalayas (*Rosa gigantea*) probably has larger flowers than any other wild rose in existence. In their native forests the flowers often reach a diameter of six inches; cultivated they should exceed this. The rose is furthermore a vigorous grower, as will be seen from this photograph of a specimen at Funchal, Madeira. It was introduced to the United States in 1902 by the Office of Foreign Seed and Plant Introduction of the U. S. Department of Agriculture, and on a number of occasions since then, and at once attracted the interest of hybridizers, who try to retain its size and vigor, while increasing its hardiness by crossing with a more cold-resistant specimen. Dr. F. Franceschi of Santa Barbara, California, has made several hybrids, which showed vigor and hardiness as well as great beauty, the flowers being creamy white with yellow centers. At the Botanic Gardens in Lisbon, Portugal, it has been crossed with the well-known rose Reine Marie Henriette, and large, rich, orange-yellow flowers produced. In warmer regions, such as California, the Southern states, and the Riviera of the Mediterranean, it is cultivated for its own sake, and its flowers, sometimes not borne very profusely, are often pure gold in color. Sir Joseph Hooker mentions a red form in Sikhim, India, but the best known type is white. Its fruit, as large as a small apple, is edible and sometimes sold in the Indian markets. The bush often makes a growth of 40 feet or more, dropping its blossoms (which at a short distance look like Clematis) from the tops of tall trees in upper Burma and western China. It flourishes best in shade.

city streets, parks, and yards more attractive as it has made them in England by the discovery of ornamental plants adapted to cultivation here. It will help prepare the young horticulturists of America for the opportunities of the tropics which are opening with such remarkable rapidity and which are sure to attract American capital and enterprise on a gigantic scale. It will do its part in enlightening the American farmer on what the other farmers of the world are doing and furnish him the material with which to compete with them in a host of lines. It will encourage the improvement of our staple crops through hybridization and selection and by the creation of entirely new hybrid crop plants whose performance is better in some commercial respect than those we now have. It will help to educate the taste of the people and show them how largely agriculture is dependent upon the caprice of fashion. It will help us to know more about the botany of our cultivated plants and study them from the broad comparative standpoint.

The Office of Foreign Seed and Plant Introduction has now been in existence for fourteen years, and its function as a part of the Bureau of Plant Industry is, I believe, pretty generally recognized. It may, however, be worth while to summarize its activities.

It has maintained since its inception one or more agricultural explorers in foreign countries. These men have been of two kinds—those like Frank N. Meyer, who have gone into out-of-the-way places and blazed the way, so to speak, for more careful detailed work later; and those who, as members of the Bureau staff, have gone out for some particular purpose, such as the investigation of some special crop or series of crops.

Of the early explorers and the romance of their travels I hope some day to publish. The public at large—hero worshipers of adventure—are now keen to learn of the hair's breadth escapes and dangers of their plant explorers, but I trust some day they will realize, as those of us do who have been out, that the great romance of this work lay in trying to forecast the future of each plant found and introduced. Time will permit me barely to mention the names of the men who have done this work. Fairchild, Swingle, Cook, Collins, Bolley, Bessey, Hansen, Carleton, Kearney, Piper, Galloway, Aaronsohn, Oliver, Knapp, Tracy, Scofield, Lake, Onderdonk, Magelssen, Meyer, Rose, Rolfs, Mann, Tull, Hills, Shear, Wight, Fraile, Boyle, Barrett, have all contributed with explorations of greater or lesser magnitude.

Aside from their direct acquisitions, these exploring trips result

in the formation of a host of foreign contacts—with agricultural experts, collectors, explorers, government officials, missionaries who represent in many cases the best men in their respective countries. With these we continually carry on exchanges of seeds and plants, and we pay them liberally for anything of value they send us. In this way, our work never stops. Correspondence with them forms a large part of the work of the office at Washington, and correspondence with United States consuls abroad is another fertile field. Many thousands of dollars' worth of work is done for us each year by consuls without compensation, and many valuable acquisitions have been made in this way.

In order to preserve an historical record of the data which accompanies this plant material, the inventory of plants imported was begun and has been maintained for thirteen years. Friends of the work declare that this is rapidly becoming of great value merely as a work of name reference. Certainly there are nowhere gathered together so many fresh impressions of travelers and foreign experts regarding the value and uses of economic plants and trees.

To supplement this inventory record there was organized and is now in full operation the economic seed collection and herbarium, and already the seed collection has become one of the most extensive in the world. This branch of the work will from now on be of increasing importance, and plans have been perfected whereby specimens of everything introduced, so far as possible, will find their way into the herbarium as soon as they have been grown and show enough characters to warrant herbarium specimens being made.

The Office is now well equipped with gardens where the plants are propagated and from which points they are sent out for trial. These are located at Chico, California; Brooksville and Miami, Florida; Yarrow, near Rockville, Maryland, and Brownsville, Texas. We have found by experience that we must have considerable amounts of material to accomplish anything substantial. The distribution of 500 trees throughout a region where they seem promising is none too many to secure a reading on its possibilities.

Practical photography has come into existence almost since the work of plant introduction began, but it is now one of the most remarkable aids in the dissemination of an interest in new fruits and other useful plants, and I believe it is safe to say that there is nowhere in the world a larger or more varied collection of photographs of economic crop plants. It is our object to make this of

the greatest possible utility to experimentation, and already hundreds of these photographs have drifted out into the ephemeral literature of the country, notwithstanding our very restricted outlets of publication.

To summarize the whole situation the Office of Plant Introduction has the following facilities which it offers to put at the disposal of the various other offices of the Bureau, the State Experiment Stations, and the private experimenters of the country:

Means of getting foreign plants into the country quickly through explorers and correspondents either on its own initiative or when requested to.

Means of recording these introductions in printed book form, as photographs, as seed or as herbarium specimens.

Means of fumigating and disinfecting these plants and seeds and minimizing any possible danger of introducing plant parasites.

Means of advertising these plants directly to experimenters by mimeographed bulletins of information.

Means of distributing these plants with proper descriptive labels to experimenters all over the country.

Means of recording every one of these distributions in such a way that ten years later it can be hunted down.

Means of following up the more promising introductions and fostering them to a point where other agencies can take them over and make financial successes of them.

Means of keeping track in the literature of new plants which come into prominence in foreign agriculture and finding out whether they are worthy of introduction into America.

Constructive Eugenics

An increase in the superior element (of our population) seems to be a more important factor in producing improvement than a decrease in the inferior element. Even if we were to go to the extreme length of cutting off entirely the reproduction of the inferior, this would not lead to an increase in the numbers of the superior, but on the contrary to a decrease; for some of the superior are the offspring of inferior parents, just as some of the inferior are the offspring of the superior.—From a report by Alexander Graham Bell, chairman of the committee on eugenics, in Proceedings of American Breeders Association, vol. IV, p. 208.

Color Inheritance in Swine

Its Relation to Dominance and the Theory of Gametic Purity; are Several Germinal Factors Required for Each Color?*

W. W. SMITH,

Purdue University, Lafayette, Indiana

Of the large mass of data available upon the Mendelian behavior of color characters in transmission there appears to be little, if any, which relates to crosses between our common breeds of swine. Since 1903 there has been some cross-breeding work in progress on the Purdue University farm, chiefly with the Yorkshire breed on the one side and the Poland China or Berkshire breed on the other. This work was carried on by Prof. J. H. Skinner with the purpose in view of producing a more profitable type of hog for the Corn Belt farm by combining the prolificacy of the Yorkshire with the early maturity and lard type character of the Poland China and Berkshire. The color records of this work have furnished considerable data relative to dominance and the theory of gametic purity. More recently matings have been made with the direct object of determining the degree and completeness of segregation in the F_2 or second hybrid generation.

The results submitted were secured with crosses between the Berkshire and Yorkshire breeds, and the Poland China and Yorkshire breeds, parent individuals representing these breeds being in all cases pure bred and registered. In all there are reported data upon the color of 115 F_1 individuals and 24 F_2 individuals. In addition, 56 F_2 individuals were produced by crosses of Berkshire-Yorkshire sows with Berkshire sires, and 9 by crossing a Berkshire sow with a Yorkshire-Berkshire sire.

In all first crosses of the breeds tested, there has never been an exception to the rule that white completely dominates black in all the 115 individuals produced. The eyes have always been pigmented. Reciprocal crosses have in all cases given identical results.

The following tabulation presents in detail the results in all first crosses:

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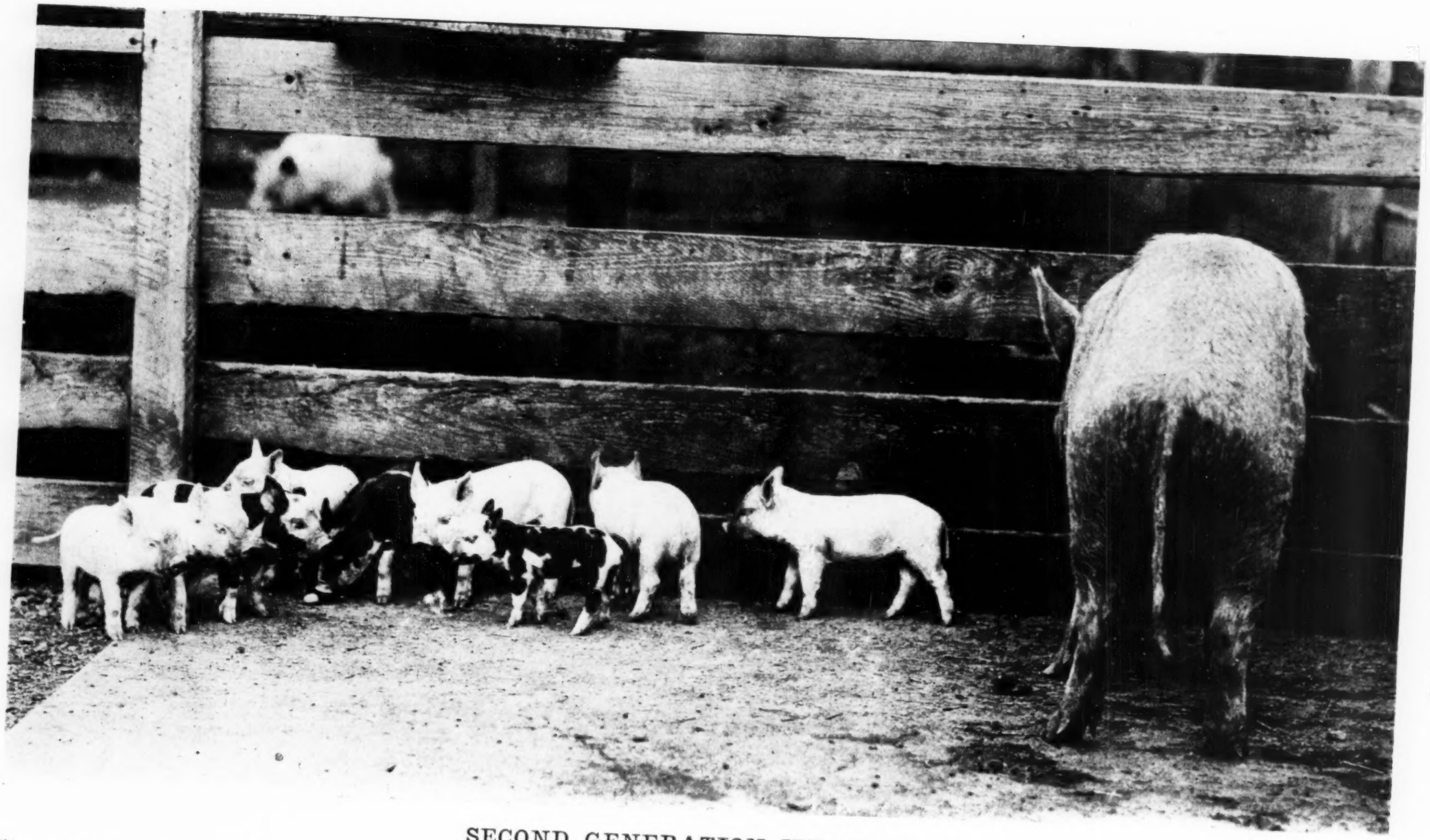
*Paper read before ninth annual meeting of the American Breeders Association at Columbia, South Carolina, January 25, 1913. Photographs by J. C. Allen.



SECOND GENERATION HYBRIDS.

The original parent colors are expressed separately, being unit characters and never blending in a gray, as one might expect. Cross-bred Berkshire-Yorkshire sow with pigs by Yorkshire-Berkshire sire. (Plate 8.)

Dam.	Sire.	Color and number of pigs.
Yorkshire No. 849	Berkshire (P. R.)	15 all white
Yorkshire No. 502	Berkshire (P. B. D.)	6 all white
Yorkshire No. 639	Berkshire (P. 632)	11 all white
Berkshire No. 928	Yorkshire (E.)	6 all white
Yorkshire No. 395	Poland China (G. P.)	12 all white
Yorkshire No. 394	Poland China (G. P.)	12 all white
Yorkshire No. 442	Poland China (344)	6 all white
Yorkshire No. 547	Poland China (P. C. B.)	9 all white
Yorkshire No. 515	Poland China (I. C.)	10 all white
Poland China No. 282	Yorkshire (390)	8 all white
Poland China No. 853	Yorkshire ($2P_2$)	11 all white
Poland China No. 595	Yorkshire	9 all white

Summary.

Yorkshire	Berkshire	32 all white
Berkshire	Yorkshire	6 all white
Yorkshire	Poland China	49 all white
Poland China	Yorkshire	28 all white
	All crossbreds	115 all white

The breeding of the pigs shown in Figure 8 is indicated by the following representation:

F_2 Pigs..... { Crossbred (701)... { Yorkshire (E) / Berkshire No. 161 } / Crossbred No. 514. { Berkshire (P. R.) / Yorkshire No. 639 }

The following represents the breeding of the pigs shown in Figure 9:

A YORKSHIRE-BERKSHIRE CROSS.

Of seven pigs originally in this litter, only one showed any trace of black—a marked example of the proposition that white dominates black in crosses of these breeds. This is the second filial generation. (Plate 9.)

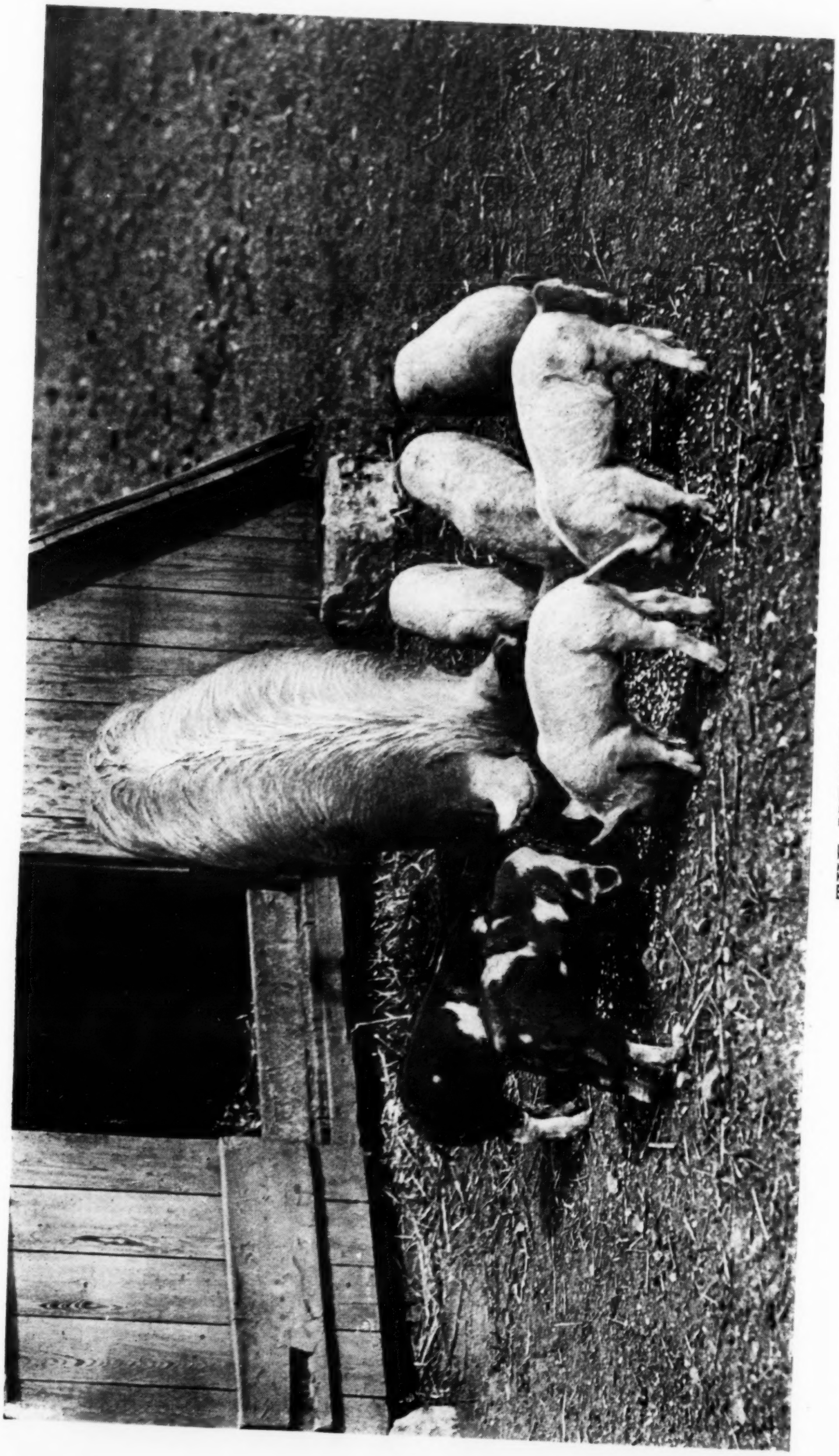
F_2 Pigs..... { Crossbred (701)... { Yorkshire (E) / Berkshire No. 161 } / Crossbred No. 513. { Berkshire (P. R.) / Yorkshire No. 639 }

The ancestry of the pigs shown in Figure 10 is identical to that of the pigs shown in Figure 9.

The fundamental idea of Mendelism is that of gametic purity. Assuming that the original Yorkshire parents possessed but one color factor in their germplasm, that being white as expressed in the individuals, and assuming likewise that the germplasm from which the Berkshire parents developed contained but one color factor, black, and that producing the characteristic black with a tendency to six white points, the pigs of the F_2 generation would be either white like the Yorkshire or black like the Berkshire, provided the gametes remained pure and preserved their identity during their association together in the F_1 or hybrid individuals. Or, assuming that the Yorkshire white and the Berkshire black of the parents are each an expression of a number of color factors or units in the germplasm, instead of a single unit, and these all moving together and behaving as a unit, the result, with gametic purity and unit behavior, would, according to the same theory, produce either the straight Yorkshire or the straight Berkshire color in the second hybrid generation.

Of the 26 pigs produced of the F_2 generation 20 were white and 6 black, all of the blacks being more or less splotched with white as shown by the illustrations. The ratio of 20 whites to 6 individuals mostly black is close enough to the typical "three to one" ratio to be strongly suggestive.

From the Mendelian point of view these results seem to indicate, first, that instead of a single germ factor for each of the parent Berkshire and Yorkshire colors, there are several factors in the case of one or both, and secondly, that this set of factors or units, say of the Berkshire, does not completely behave as a unit when crossed with the Yorkshire. The contact of the Berkshire set of factors



THE MENDELIAN RATIO.

In this second generation litter of Yorkshire-Berkshire hybrids, seven pigs were white and two black with a little white, a close approximation to the ratio of 3 to 1 which Mendel's law requires. (Plate 10.)

with the Yorkshire factor or factors in the first cross may disturb or destroy the unity of one set or the other. With this assumption the result would probably be independent behavior on the part of some of the factors in the production of the F_2 or second hybrid generation instead of a behavior determined by the whole set as a unit. This hypothesis would allow a Mendelian interpretation of the results presented.

Fifty-six pigs have been produced by mating Berkshire-Yorkshire sows with Berkshire sires. The results of all these matings are fairly represented by the litter shown in Figure 11. Also, one litter of 9 pigs was produced by mating a Berkshire sow with an F_1 hybrid sire. The result of this mating was two white pigs and seven in whom black predominated. Two of the latter died.

The following pedigree shows the breeding of the pigs shown in Figure 11:

F_2 Pigs..... { Berkshire (P. R.)
Crossbred No. 785 { Berkshire (P. R. h.)
Yorkshire No. 588

The breeding of the litter of nine pigs above mentioned is shown by the following pedigree:

F_2 Pigs..... { Crossbred (701) { Yorkshire (E)
Berkshire No. 161
Berkshire No. 407

The results secured in mating when one parent was a first generation hybrid of the Berkshire and Yorkshire, and the other a Berkshire are shown in detail by the following table:

THREE-QUARTERS BERKSHIRE.

An exceptionally large proportion of black was shown in this cross of a Berkshire-Yorkshire sow by a Berkshire sire. Two other pigs, which died, were preponderatingly black in color, making only five of eleven pure white. (Plate 11.)

Dam.	Sire.	Number and Color of Pigs.
Berkshire-Yorkshire No. 785	Berkshire (P. B. D.)	3 white, 3 black with some white
Berkshire-Yorkshire No. 785	Berkshire (P. B. D.)	5 white, 6 black with some white
Berkshire-Yorkshire No. 785	Berkshire (P. R.)	7 white, 5 black with some white
Berkshire-Yorkshire No. 834	Berkshire (P. B. D.)	7 white, 5 black with some white
Berkshire-Yorkshire No. 834	Berkshire (P. B. D.)	6 white, 4 black with some white
Berkshire-Yorkshire No. 794	Berkshire (P. B. D.)	2 white, 3 black with some white
Berkshire No. 407	Yorkshire-Berkshire No. 701	2 white, 7 black with some white

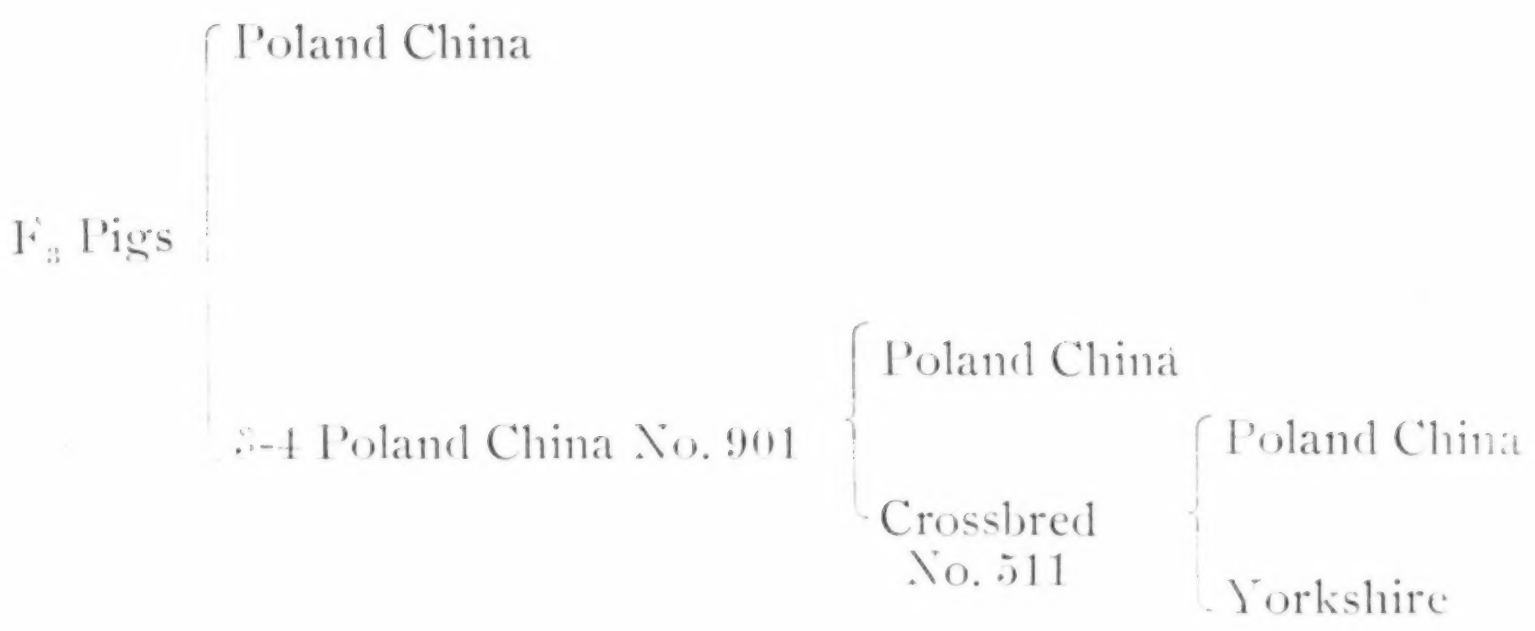
If the hybrid parent in each case had produced gametes one-half of which, on the average, contained the color factors intact as they were contained by one of its parents, and one-half of which contained unaltered the color factors of the other parent, there would have been produced 32 pigs of one parent color and 33 pigs of the other parent color. The actual results were 32 white pigs and 33 which were black with some white.

By mating a three-quarter bred Poland China sow, white in color, with a Poland China sire two litters of 21 pigs have been produced. Figure 12 shows the colors of one litter of the pigs, which were seven-eighths Poland China. The other litter was smaller, but the coloration similar.

The following shows the pedigrees of the pigs in these two litters:

IN THE THIRD GENERATION.

Three-fourths Poland China sow bred by Poland China sire. In this generation the white pigs seem infected by black, while in the two first generations the reverse appeared to be the case. (Plate 12.)



Considering both the above litters, 11 were black or mostly black, 7 were mostly white, 2 were white, and 1 half black and half white. Instead of the black pigs showing apparent contaminations of the white, as appeared to be true in practically all of the F_2 pigs produced, the white pigs seem to have been infected with black.

These results show, in the first place, complete dominance of the Yorkshire white over the Berkshire or Poland China black in the F_1 or first hybrid generation;

Secondly, they show a general tendency for the original parent colors to be expressed separately, and in the proportion of 3 dominants to 1 recessive, in the individuals of the F_2 or second hybrid generation, and

Thirdly, in nearly all cases the recessive black of the F_2 generation carried more white than the original black parents. This suggests the requirement of a number of germinal factors for each color rather than a single factor. Although the factors may behave as a unit or single factor when mated with individuals carrying like factors, when crossed, the unity is destroyed and independent behavior on the part of some of the factors is the possible result.

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IV^e^ Conférence Internationale de Génétique, Paris, 1911. Comptes rendus et rapports édités par Ph. de Vilmorin, Secrétaire de la Conférence, Paris, 1913, gr. 8., 10 + 571 pp., 10 col. plates, 4 full page cuts, and 206 text cuts.[1]

[1] Masson et Cie, 120 Boulevard Saint-Germain, Paris (VI^e^). Price 25 francs.

This very well gotten up report of the fourth International Congress of Genetics, held at Paris from Sept. 19 to 23, 1911, is a result of the tireless energy and unflagging interest of the secretary, M. Philippe L. de Vilmorin, already known to many of the readers of the American Breeders' Magazine. As these congresses are wisely held only once every four years there is always an abundance of new and important matter to discuss.

The report of the proceedings of the Congress is in French and occupies 60 pages. The original papers are printed either in French or English; if in French they have an English résumé, and if in English they have a French résumé. Forty-two papers contributed by many of the best-known students of genetics are printed in the report, accompanied in many cases by the discussion. The articles are profusely illustrated and the interest of the report is enhanced by the fact that a portrait of almost every delegate is printed along with his paper.

In view of its good paper, clear type, excellent and very numerous illustrations, as well as because of the number and interest of the papers and the excellence of the editorial supervision, this report is sold at a very low price. It should be in the hands of every one interested in plant or animal breeding or in eugenics.

WALTER T. SWINGLE.

Association Matters

Following the change in administration of the Department of Agriculture, and the consequent change necessary in the officers of the American Breeders Association, a meeting of the council was held at the Smithsonian Institution, Washington, D. C., on April 22, 1913, at which Messrs. Castle, Cook, Davenport, Fairchild, Kearney, Swingle and Van Wagenen were present, Messrs. Webber, Detlefsen and Hays being represented by proxies in the hands of Messrs. Swingle, Cook, Fairchild and Kearney. On motion of Mr. Davenport, it was decided to incorporate the association and reorganize it financially. Mr. Castle, as chairman, appointed Alexander Graham Bell, T. H. Kearney and David Fairchild as a committee on incorporation, and, on April 28, the association was incorporated under the laws of the District of Columbia, retaining its old name and taking over the membership and interests of the unincorporated

association. Mr. Fairchild undertook to raise a guarantee fund of $3,000 annually for three years, in order to enable the association to continue its work, and was successful in doing this, through the generosity of a number of friends and members of the association.

On June 18 a formal meeting of incorporation was held, at which a revised constitution and by-laws were adopted to comply with the corporation laws. These will be printed in THE AMERICAN BREEDERS MAGAZINE as soon as space permits. Control is vested in a council of nine, three of whom are to be elected annually, to serve for three years. The following were elected as members of the council to serve until the next annual meeting, when a new council will be elected by the entire membership of the association: David Fairchild, W. E. Castle, Arthur W. Gilbert, W. S. Anderson, Bleecker Van Wagenen, Alexander Graham Bell, George M. Rommel, O. F. Cook and T. H. Kearney.

On September 1 a meeting of the council was held in the Cosmos Club, Washington, D. C., to complete organization. The following officers were nominated and elected, to hold office until the annual meeting in January, 1914: president, David Fairchild; vice-president, W. E. Castle; secretary, George M. Rommel; treasurer, Corcoran Thom. As editor of THE AMERICAN BREEDERS MAGAZINE, Paul B. Popenoe, of Altadena, California, was elected. It was voted to begin the publication of the magazine on a monthly basis as soon as possible.

At the last meeting of the old council, an advisory vote favored a change in the name of the magazine to make it indicate more clearly the broad field which it covers. "The American Genetics Magazine" was suggested as a title. The new council decided that the present title ought to be retained for the three numbers which will complete the present volume. Beginning with the first number of volume five, in January, the name of the magazine may be changed, at the same time that the magazine is increased to the standard magazine size of seven by ten inches. Suggestions of a suitable name will be welcome.

At the last annual meeting of the association, Dr. Alexander Graham Bell of Washington, D. C., and Victor Lemoine of Nancy,

France, were elected honorary life members, in recognition of their unusual services to the science of genetics.

A resolution was passed urging upon all public forest bureaus and private agencies the importance of devoting some of their time and money to experiments for improving the productive capacity of forest and nut-bearing trees, by systematic experiments in breeding.

A resolution was passed urging a stricter examination of aliens at their points of entry as immigrants to the United States, with a view to preventing the entry of many who are mentally and physically defective and yet obtain admission because of inadequate laws and facilities,—not because of lax enforcement of the existing laws. The association recommended that "Decision No. 120" and the decision that minor children of naturalized immigrants are exempt from the operation of the immigration laws should be reversed, and that the period of deportation, except in the case of immoral persons, as to whom there is and should be no limit of time, should be extended to five years, and that the burden of proof should be changed so that the alien must show that the cause of his becoming a public charge arose subsequent to his landing.

Owing to postal regulation, the publishers of *Outdoor Life and Recreation* have been obliged to discontinue sending their publication to members of the American Breeders Association, as was formerly done through the generosity of Charles Willis Ward.

By a vote of the old council, the fee for life membership, which in the past has been $20, was increased to $50.

The next annual business meeting of the association will be held in Washington, D. C., on the second Thursday in January, at five o'clock in the afternoon.